

BACHELOR OF SCIENCE IN NUCLEAR AND RADIOLOGICAL ENGINEERING - NUCLEAR ENGINEERING CONCENTRATION

The undergraduate curriculum in nuclear and radiological engineering is structured to meet the needs of both the student who contemplates employment immediately after graduation and the student planning to pursue graduate study. It provides maximum flexibility in the form of options for each student to develop his or her unique interests and capabilities. The core curriculum covers the basic principles of nuclear engineering, nuclear reactor core design, reactor systems engineering, nuclear power economics, reactor operations, radiation sources and detection instruments, radiation transport, radiation protection, criticality safety, regulatory requirements, and radioactive materials management.

In addition to the Institute's academic requirements for graduation with a bachelor's degree, the following are required for a BS NRE degree.

- A C or better must be earned in:

Code	Title	Credit Hours
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4

- The cumulative GPA of all required NRE and ME classes plus classes used for the concentration must be 2.0 or higher.

Program Educational Objectives

The program educational objectives reflect the needs of the program's constituencies and have been reviewed and validated by our constituents.

- NRE graduates will positively contribute to nuclear and radiological engineering and related fields.
- NRE graduates will conduct themselves with the highest professional and ethical principles that include considerations of public safety and the environment.
- NRE graduates will engage in life long learning through graduate and continuing education, professional development activities, or other career appropriate options.

Code	Title	Credit Hours
Wellness		
APPH 1040	Scientific Foundations of Health or APPH 10 The Science of Physical Activity and Health	2
Core A - Essential Skills		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3

MATH 1552	Integral Calculus ¹	4
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Core B - Institutional Options

CS 1371	Computing for Engineers	3
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Core C - Humanities

Any HUM (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-c/) ²		6
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Core D - Science, Math, & Technology

PHYS 2211	Introductory Physics I	4
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PHYS 2212	Introductory Physics II	4
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MATH 1551	Differential Calculus ¹	2
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MATH 1553	Introduction to Linear Algebra ¹	2
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or MATH 1554 Linear Algebra

or MATH 1555 Linear Algebra with Abstract Vector Spaces

Core E - Social Sciences

Select one of the following:		3
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HIST 2111 The United States to 1877

HIST 2112 The United States since 1877

INTA 1200 American Government in Comparative Perspective

POL 1101 Government of the United States

PUBP 3000 American Constitutional Issues

Select one of the following: ³		3
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ECON 2100 Economic Analysis and Policy Problems

ECON 2101 The Global Economy

ECON 2105 Principles of Macroeconomics

ECON 2106 Principles of Microeconomics

Any SS (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-e/) ²		6
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Core F - Courses Related to Major/Lower Division Courses

CHEM 1310	General Chemistry ⁴	4
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MATH 2551	Multivariable Calculus ¹	4
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MATH 2552	Differential Equations ¹	4
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MSE 2001	Principles and Applications of Engineering Materials	3
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NRE 2120	Elements of Nuclear and Radiological Engineering	3
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Ethics Requirement (<http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/ethics/>) ²

Major Requirements

NRE 3026	Experimental Nuclear Reactor Physics	3
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NRE 3112	Nuclear Radiation Detection	3
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NRE 3208	Nuclear Reactor Phys I	3
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NRE 3301	Radiation Physics	3
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NRE 3316	Radiation Protection Engineering	3
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NRE 4350	Design Methods & Tools	3
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NRE 4351	Design of Nuclear and Radiological Systems	3
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Non-NRE Requirements

COE 2001	Statics	2
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ECE 3710	Circuits and Electronics	2
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ECE 3741	Instrumentation and Electronics Lab	1
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ISYE 3025	Essentials of Engineering Economy	1
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ME 3322	Thermodynamics	3
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ME 3340	Fluid Mechanics	3
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MATH 3670	Probability and Statistics with Applications	3
Nuclear Energy Concentration requirements ⁵		
ME 3345	Conduction and Radiation Heat Transfer	3
NRE 4210	Nuclear Reactor Theory	3
NRE 4214	Reactor Engineering	3
Math/Science Elective	⁶	3
Engineering Elective	⁷	3
Free Electives		
Free Electives (1000-level or higher)	⁸	3
Free Electives (2000-level or higher)	⁹	9
Total Credit Hours		126

No Pass-Fail courses allowed

Students must earn a minimum Major GPA of 2.0 (truncated). Major GPA includes all required NRE and ME classes plus classes used for the concentration. If a class is repeated, only the last grade is included in the calculation.

- ¹ Minimum grade C
- ² Ethics Overlay may be Humanities or Social Sciences and can be any course from the GT-approved list: <http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/ethics/>.
- ³ Students can receive credit for only one of ECON 2100, ECON 2101, ECON 2105 and ECON 2106. The only exception is that students can receive 6 hours credit for both ECON 2105 and ECON 2106.
- ⁴ CHEM 1211K can substitute for CHEM 1310. CHEM 1211K and CHEM 1212K are recommended for pre-health students.
- ⁵ Students must satisfy the requirements of EITHER the Nuclear Engineering (NE) Concentration or the Radiological Science and Engineering (RSE) Concentration. NE Concentration requires ME 3345, NRE 4210, and NRE 4214; RSE Concentration requires NRE 4328 and two courses from the following list: NRE 4750, NRE 4803 (Nuclear Safeguards), and NRE 4407. Students may complete both Concentrations using free or engineering electives.
- ⁶ Any Math or Science at 2000 level or higher with the exception of selected 1000-level courses: BIOL 1510, BIOL 1520, and CHEM 1212K.
- ⁷ Engineering Elective is any class from the College of Engineering at the 2000-level or higher excluding: ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4741, ME 4742, and ME 4753. Also excludes project-type courses such as VIP, and 2699, 2903, 4699, 4903 classes. Cannot duplicate any other material used to satisfy the BSNRE degree requirements.
- ⁸ Free 1XXX: Cannot duplicate any other material used to satisfy the BSNRE degree requirements.
- ⁹ Free 2XXX: At least 9 hours of free electives must be at the 2000 level or above with the exception of 4 hours that may be satisfied with one of the following: BIOL 1510, BIOL 1520, or CHEM 1212K. Cannot duplicate any other material used to satisfy the BSNRE degree requirements

Cooperative Plan

Since 1912, Georgia Tech has offered a five-year **Undergraduate Cooperative Program** to those students who wish to combine career-related experience with classroom studies. The program is the fourth oldest of its kind in the world and the largest optional co-op program in the country.

Students alternate between industrial assignments and classroom studies until they complete three semesters of work. Co-op students with nuclear and radiological engineering majors complete the same coursework on campus that is completed by regular four-year students. Most co-op students begin the program as freshman or sophomores and are classified as full-time students regardless whether they are attending classes on campus or are full-time at an employer's location.

Students who participate in the program have the opportunity to develop career interests, become more confident in their career choices, and develop human relation skills through their work experience. Graduates of the program receive a bachelor's degree with a Cooperative Plan Designation. Woodruff School students have traditionally been the largest group participating in the program.

Students can also complete work assignments in a foreign country as part of the **International Cooperative Program**. This program is a great opportunity to utilize foreign language skills, gain a global perspective, and experience a diverse culture. Proficiency in a foreign language is necessary to earn the International Cooperative Plan degree designation. For more information on the Cooperative Program, go to <http://career.gatech.edu/co-op> (<http://career.gatech.edu/co-op/>).

The **Undergraduate Professional Internship Program** is for nuclear and radiological engineering students who do not participate in the Cooperative Program, but want some career-related experience before graduation. Students generally work for one semester, usually in the summer, with an option for more work. Students must have completed at least thirty hours of coursework at Georgia Tech before they can participate in the program. For more details, see: <http://career.gatech.edu/internships> (<http://career.gatech.edu/internships/>).

In addition, there is a Work Abroad Program (www.workabroad.gatech.edu (<http://www.workabroad.gatech.edu/>)), which complements a student's formal education with paid international work experience directly related to nuclear and radiological engineering. Participating students typically include juniors and seniors. The international work assignments are designed to include practical training, cross-cultural exposure and learning, and the acquisition of needed skills.

For more information about all of the programs in the Center for Career Discovery and Development, visit www.careerdiscovery.gatech.edu (<http://careerdiscovery.gatech.edu/>).

The BS/MS Program

The Woodruff School offers a BS/MS program for those students who demonstrate an interest in and ability for additional education beyond the BS degree. Woodruff School students with a GPA of 3.5 or higher are eligible to apply for the program after completion of 30 credit hours at Georgia Tech, but before the completion of seventy-five credit hours, including transfer and advanced placement credits. Students who have more than 75 credit hours will be considered for the program on a case-by-case basis

Participants in the BS/MS Program in the Woodruff School can obtain a master's degree in mechanical engineering, nuclear engineering, medical physics, or in Georgia Tech's interdisciplinary bioengineering graduate program. There are two options to consider.

Non-Thesis Option

The Non-Thesis Option is completed by taking 10 classes according to the MS degree requirements. In many cases, two courses can be counted towards both a student's BS and MS degrees, thereby streamlining the

process. With proper planning, most MS non-thesis degrees could be completed in one year.

Thesis Option

The Thesis Option involves working with a faculty member on a project in a wide range of research topics being investigated by Woodruff School faculty members. This will give you hands-on experience in working with a faculty mentor; the opportunity to work in a laboratory or a research environment; and the chance to perform theoretical and experimental work. These events will foster your career interests and expand your selection of possible employers. In some cases, a student will receive a graduate research assistantship, which includes a stipend and a tuition waiver. The time to graduation depends on your thesis project, your advisor, and your work ethic.

During the first year of your graduate studies, you will be encouraged to continue for the PhD. In many cases, you might be working on an interesting topic of study as part of your master's degree research that could provide the basis for doctoral research.

BS/MS Information (<https://www.me.gatech.edu/undergraduate/bsms/>)